

CHAPTER 12

LIGHTNING

Lightning is a sudden electrical discharge released from the atmosphere that follows a course from cloud to ground, cloud to cloud, or cloud to surrounding air, with light illuminating its path. Lightning's unpredictable nature causes it to be one of the most feared weather elements.

Although not as significant in relation to other hazards, lightning remains a certain danger in Wyoming. Anyone that is caught in an exposed area during a thunderstorm could be at risk to a lightning strike. In Wyoming, outdoor enthusiasts venturing to high and exposed areas should be especially cautious because rapid thunderstorm development with associated lightning can place even the most experienced climbers in jeopardy without warning. Hikers and climbers above the timberline should plan to be off exposed mountain tops and ridges by 1400 MST during the summer months to avoid being struck by lightning unless proper shelter is available (Wyoming Climate Atlas).

History

U.S. statistics show that one in 345,000 lightning flashes results in a death and one in 114,000 results in an injury. According to meteorologists at Vaisala, Inc., the odds for an American being hit by lightning sometime in the course of an 80-year lifespan is about 1 in 3,000. Wyoming ranks 36th in number of lightning fatalities, 33rd in injuries, and 40th in property damage from 1959 to 1994 according to the National Oceanic and Atmospheric Administration, National Severe Storms Laboratory (NOAA, NSSL). From 1953 to 2006 lightning has been responsible for 36 deaths, 104 injuries, over \$4.4 million in property damage, and \$22,750 in crop damage in Wyoming. Dollar damage estimates may include damage from associated severe weather, including precipitation and wildland fire. Table 12.1 includes Wyoming lightning events that have caused deaths, injuries, and damage in Crook County from 1953 to 2006. An NCDC query returned no results for lightning incidents in Crook County post-2006. Lightning has injured climbers on Devils Tower, sparked numerous wildfires, and impacted buildings within the County. According to the data in the table, a damaging lightning event occurs every 3.3 years in the County. Vaisala data lists Wyoming as 38th in the U.S. for cloud-to-ground lightning flash density with 3.1 flashes per square mile between 1997 and 2011. The same data set showed that Wyoming averaged 300,919 flashes per year between 1997 and 2011.

According to the Vaisala Group and National Lightning Detection Network, Wyoming ranked 27th among the 50 U.S. states, Puerto Rico, and Washington D.C. for overall lightning deaths between 2002 and 2011. Five people died from lightning events in Wyoming during that time frame. This would suggest that lightning is not a major hazard for Wyoming. However, the state had the highest per capita fatality rate within that same time period at 0.96 deaths per million people. **Error! Reference source not found.** illustrates the number of lightning fatalities that occurred in each state between 2002 and 2011. Figure 12.2 depicts the lightning fatalities per state weighted by population.

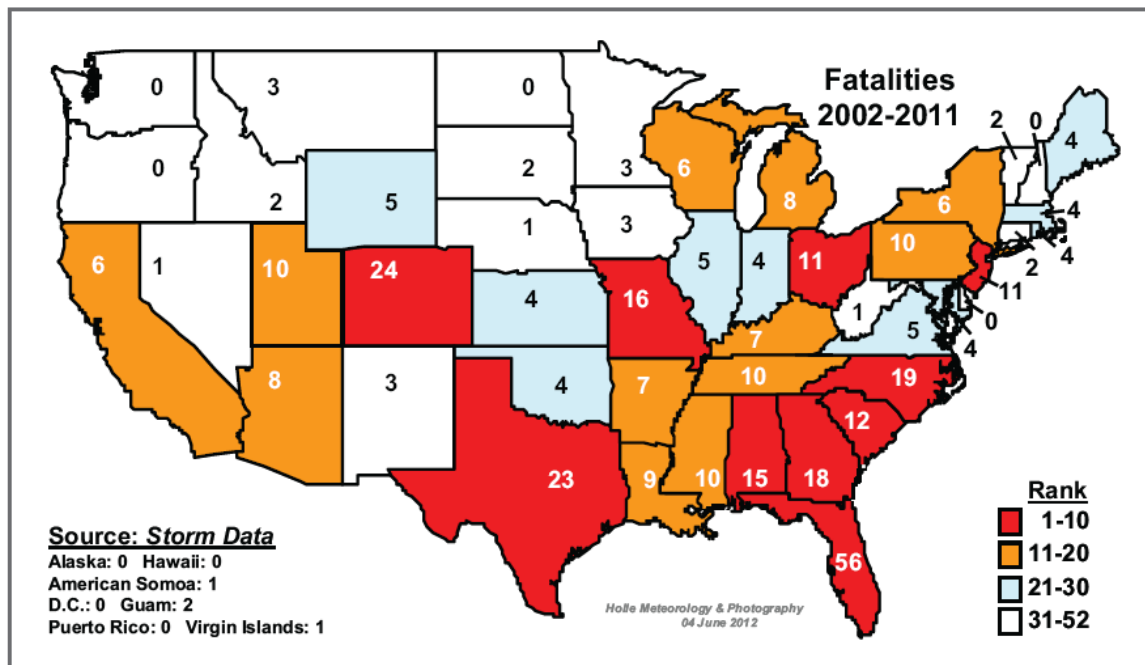


Figure 12.1—Lightning Fatalities by State: 2002-2011

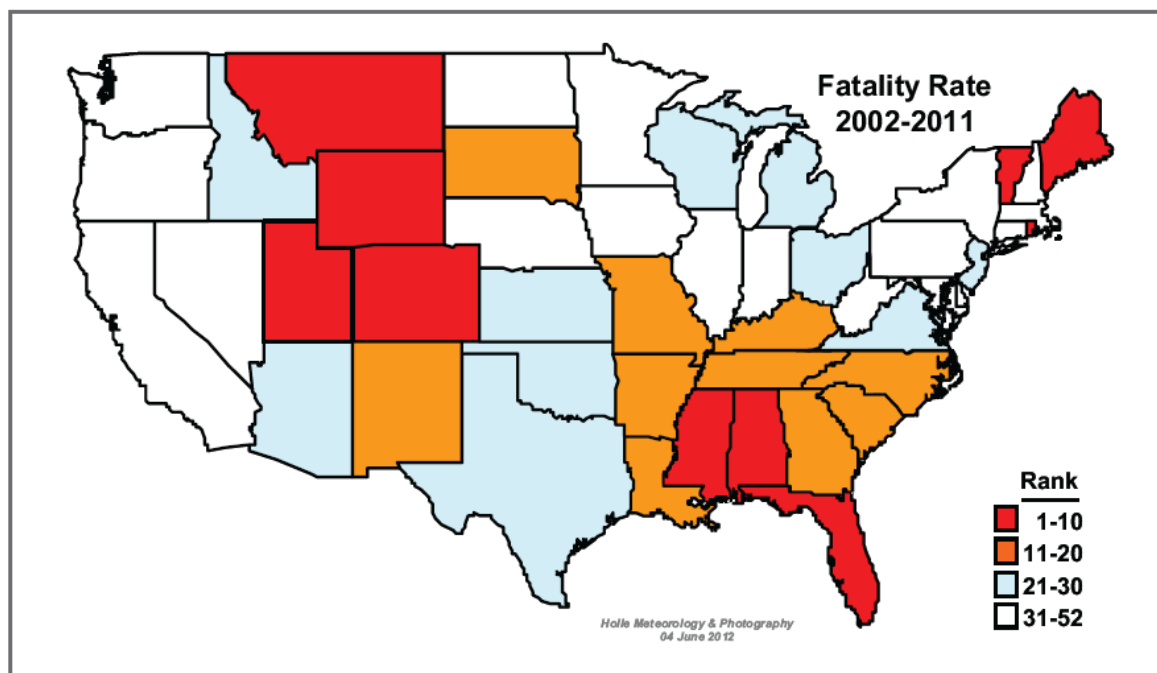


Figure 12.2—Lightning Fatalities Weighted by Population by State: 2002-2011

Table 12.1 Crook County Damaging Lightning Events: 1953-2006

County	Location	Date	Number killed	Number injured	Estimated property damage	Estimated crop damage	Total estimated damage (current year USD)	Information
Crook	Sundance	1-Sept-1953	1					One man was killed in an electrical storm near Sundance early in the month.
Crook		7-Aug-1982	0	0	\$27,500	\$0	\$27,500	Lightning strikes caused two fires that burned 55 acres of timber and grass. 15 acres on the Ivan Policky ranch and 40 acres on the old Maurice Hauber ranch 1.5 miles from Devil's Tower.
Crook	Moorcroft	5-Aug-1985	0	0	\$2,750	\$0	\$2,750	Severe winds accompanying a thunderstorm knocked down light and power poles. Heavy lightning and only a very small amount of rain occurred.
Crook, Campbell	Moorcroft 7w	30-Jul-1987	0	0	?	?	\$0	A very strong thunderstorm developed near Savageton, about 40 miles southwest of Gillette, at 2045 MST. This storm at Savageton drenched the town with 1.5 inches of rain in 35 minutes along with 1.5-inch-diameter hail. The storm later moved northeast during the next few hours and damaged structures in the south and east sections of Gillette. As the thunderstorm moved into Gillette, 50 to 60 mph winds raked the area along with 1.50 inches of rain in 1 hour. This storm destroyed 1 unoccupied home. Other damages included numerous horse stalls destroyed, sections of roofs partially destroyed and many city and state road signs severely damaged. Also, lightning struck a home in Gillette and knocked a hole in the ceiling. Many streets and a few apartments were flooded due to the torrential rains between 2100 and 2200 MST. Later that night the very strong thunderstorm moved into Crook County with heavy rain and 0.5-inch-diameter hail west of Moorcroft.
Park, Teton, Sweetwater, Sheridan, Natrona, Fremont, Albany, Laramie, Crook, and Johnson		3-Jul-1988	0	0	Same as 1 July 1988	\$0	\$0	During the month of July, at least 59 fires were started by lightning from mostly high-based thunderstorms that produced little rainfall. These included very large forest fires such as the Clover Mist Blaze in Yellowstone National Park and the Lost Fire over the Big Horn Mountains of northern Wyoming. On a week-by-week basis, the breakdown of lightning fire is as follows. Before and including the 2nd, fourteen lightning fires were started. During the 10th through the 16th, 18 such fires were reported. From the 17th through the 23rd, there were eight fires. Between the 24th and 30th, ten lightning blazes occurred. Finally, on the 31st, there were four fires. According to the BLM for Wyoming, 3,644.3 acres

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								were torched with an estimated lost resource value of \$364,430. This does not include the fires started by lightning in Yellowstone National Park because this information is not yet available.
Park, Teton, Campbell, Crook, Natrona, Sweetwater and Weston		1-Aug-1988	0	0	\$415,900	\$0	\$415,900	With the continuation of the hot, dry weather, at least 29 fires were started by lightning during the month of August. The thunderstorms that were responsible for the ignitions were generally high-based and produced little rainfall. Most of these fires were relatively small, less than 100 acres. However, the Dorn #2 fire, located in Washakie County, on August 14th, grew to 1514 acres. The largest blaze was the Fern Fire, located in Yellowstone National Park. That fire occurred on August 5th. The Fern Fire torched 2000 acres before it burned into the Clover Mist blaze (another fire ignited by lightning during the previous month of July). On a week-by-week basis, the breakdown of lightning fires is as follows. From the 1st to the 6th, there were 10 such blazes. Between the 7th and 13th, another 10 lightning fires occurred. During the 14th to the 20th, 6 fires were reported. Finally, from the 21st through the 2 th, there were 3 blazes. According to the BLM for Wyoming, 4,159 acres were torched with and estimated lost resource value of \$415,900. That figure does not include the fires started by lightning in Yellowstone National Park because this information is not yet available.
Crook		15-Jul-1995	0	0	0	0	0	Lightning knocked out power in Newcastle.
Crook	5 N Sundance	18-Jul-1998	0	0			\$0	Lightning caused a 0.5-acre fire of pine trees and grass.
Crook	Countywide	14-Jul-2000	0	0			\$0	Lightning caused seven wildfires throughout the county. The largest was 400 acres.
Crook	Countywide	27-Jul-2000	0	0			\$0	Lightning caused five fires throughout the county. Four of the fires were small and easily contained. The fifth fire, northwest of Hulett, reached several hundred acres before crews had it under control.
Crook	Countywide	10-Aug-2000	0	0			\$0	Eighteen fires were started by lightning. The largest fire burned 4,000 acres in the New Haven area and took several days to contain. The rest were contained within 24 hours.
Crook	New Haven	8-Jul-2001	0	0	\$0		\$0	A thunderstorm moved across Crook County producing very large hail. Hail ranging in size from

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County	Location	Date	Number killed	Number injured	Estimated property damage	Estimated crop damage	Total estimated damage (current year USD)	Information
								pennies to tennis balls pelted Devils Tower for 40 minutes. Four injuries (direct) were climbers on Devils Tower who were hit by hail. Two injuries (direct) were the result of a lightning strike. The injuries were not life threatening, and it is not known if medical attention was administered. Damage to several cars was reported as "significant."
Crook	Devils Tower	8-Jul-2001	0	2	\$0		\$0	A thunderstorm moved across Crook County producing very large hail. Hail ranging in size from pennies to tennis balls pelted Devils Tower for 40 minutes. Four injuries (direct) were climbers on Devils Tower who were hit by hail. Two injuries (direct) were the result of a lightning strike. The injuries were not life threatening, and it is not known if medical attention was administered. Damage to several cars was reported as "significant."
Crook	Moorcroft	9-Jul-2001	0	0	\$250,000		\$250,000	Lightning struck a building in downtown Moorcroft. The fire ignited the building, a sporting goods store. Most of the building was destroyed.
Crook	3 NE Moorcroft	15-Aug-2001	0	0	\$0		\$0	Lightning ignited a fire around Keyhole Reservoir. The fire burned 172 acres.
Crook	Thorn Divide	13-Jul-2006	0	0	\$0		\$0	Lightning ignited several fires around Thorn Divide.

Impacts

Nationwide lightning strikes are routinely monitored by Vaisala, Inc. with accuracies to within a 0.625-mile (1 kilometer) resolution. For the period of 1997 through 2010, the annual lightning strike frequency for the continental U.S. is depicted in Figure 12.3. The approximate area for Crook County is circled in white in Figure 12.3. Clearly the eastern plains have more than three times the cloud to ground lightning strikes as does the western half of the state. Platte, Weston, Crook, and parts of Campbell, Niobrara, and Laramie counties are the most active in the state. These values probably vary by 50% in a year depending on whether there is a drought or enhanced monsoonal flow. However, the locations of maximum and minimum strikes do not change much from year to year.

Lightning is the leading cause of wildland fires in Wyoming, and is indirectly responsible for millions of dollars worth of fire damage. Whether in a drought or wet period, Wyoming's hot and windy summers can cause rapid changes to the fire risk over grasslands and forests. In Figure 12.4, a 31-year record of lightning-caused wildfires as well as the percent of lightning-induced wildfires is shown. The worst events occurred in July and August 1988, when, according to the U.S. Bureau of Land Management, lightning ignited 29 fires, setting 4,159 acres ablaze, resulting in a total of \$780,330 (\$1,458,700 in 2010 USD) in damage.

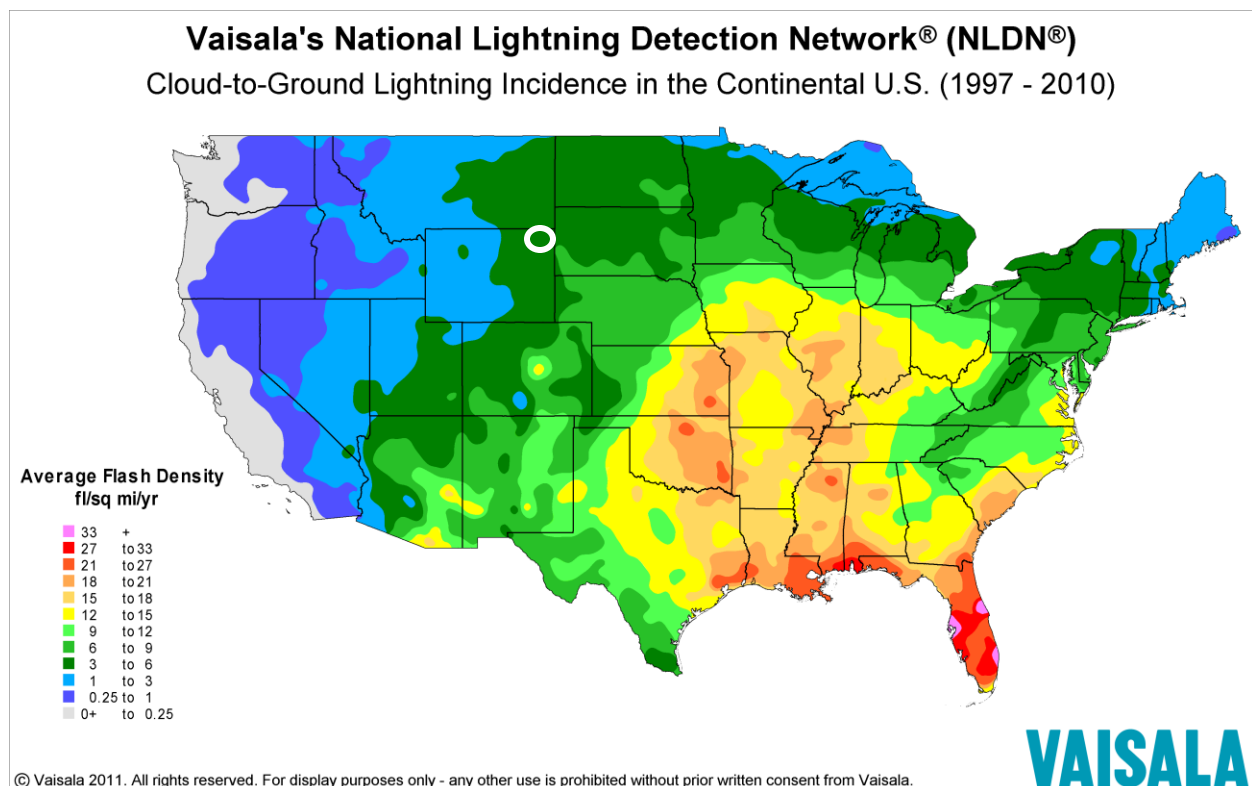


Figure 12.3—Cloud-to-Ground Lightning Flash Density in Continental U.S.: 1997-2010 (Crook County approximate area circled in white)

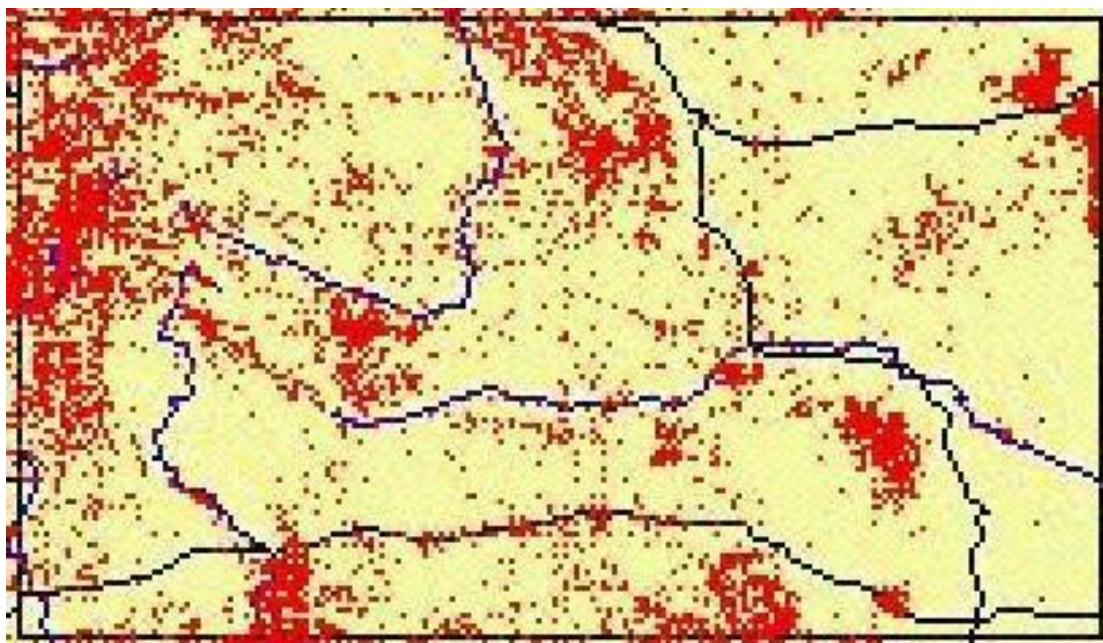


Figure 12.4—Wyoming lightning induced fire source points (1970-2000). Illustration courtesy of Wyoming Climate Atlas.

Future Impacts

Future impacts from lightning are difficult to determine because of the erratic nature of storms. Because of Crook County's location in the eastern plains of Wyoming it will remain susceptible to lightning strikes and resulting wildfires. A damaging lightning event occurs every 3.3 years in the County. Impacts to persons and property are likely to remain isolated. Due to the nature of lightning, those at greatest risk for life-threatening lightning hazard impacts fall within two categories: those enjoying outdoor activities and those in poor health who rely on electricity. Outdoorsmen, climbers on Devils Tower, and outdoor workers are susceptible to direct lightning strikes and/or to wildfires started by lightning. Individuals reliant on electricity to meet day-to-day health needs, such as those reliant on oxygen machines for example, may be impacted by lightning because of lightning-caused power outages. Both of these groups most vulnerable to lightning are more susceptible to serious injury or death.

Lightning caused wildland fires may result in more extensive damage. Additional impacts exist to property located in areas susceptible to wildland fire, which is addressed in the "Wildland Fire" chapter in this plan. While Wyoming's population continues to grow, as documented by the 2010 census, development has no impact on locations where lightning may strike, but potentially increases the exposure of people and property to lightning impacts.

Summary

PROPERTY AFFECTED: Low

POPULATION AFFECTED: Low

PROBABILITY: High

JURISDICTION AFFECTED: County and all jurisdictions